ELECTROFORCE

JUNE
19-20-21
1913

Milwaukee
Wis.

Exhibition
Number

BIG ELECTRICAL SHOW

15,000 Sq. Ft. Display Space

JUNE 19–20-21 MILWAUKEE

The first real electrical show to be held in Wisconsin will be a complete revelation even to those acquainted with the plans Electroforce Publishing Co., has made for this affair.

It will be a show for everybody, the layman will be fasinated and the electrical man deeply interested. Many of the large electrical manufacturing concerns of the country have arranged for display space.

1,000,000 Volt 30-inch Coil, Wireless Telegraphy and Telephony, Commercial Telephone Exchange in operation, Motors, Dynamos, X-Ray, Manufacture of Lamps, Electric Cables, Devices, A. C. Motors, Transformers, Generators, etc.

The most noteworthy feature will be the fact that this will be a working exhibit—not just many feet of display shelves. Every kind of electric lighting, heating and power device will be in operation to reveal to everyone the real advantages.

The entire first floor and half of the third floor of the large Stroh Bldg., will be devoted to this exhibition, which will be worth going miles to see. We therefore remind you to

BE SURE TO ATTEND!

Electroforce Readers Will Be Sent A Ticket Free of Charge.

There will be no charge for entrance which is made possible by the hearty co-operation of the electrical manufacturers, electrical business men and the Electroforce Publishing Company.

MAKE A NOTE OF THE DATE

TEAR OUT THE COUPON

IT CAN BE USED AS A

Free Admission Ticket

TO

Milwaukee Electrical Show

STROH BUILDING, Jackson and Michigan Sts.

June 19, 20 and 21, 1913

See the complete Telephone Station, the completely wired model house, the Aeroplane, wireless telegraph, etc.

CUT HERE

ADMIT THE BEARER

TO

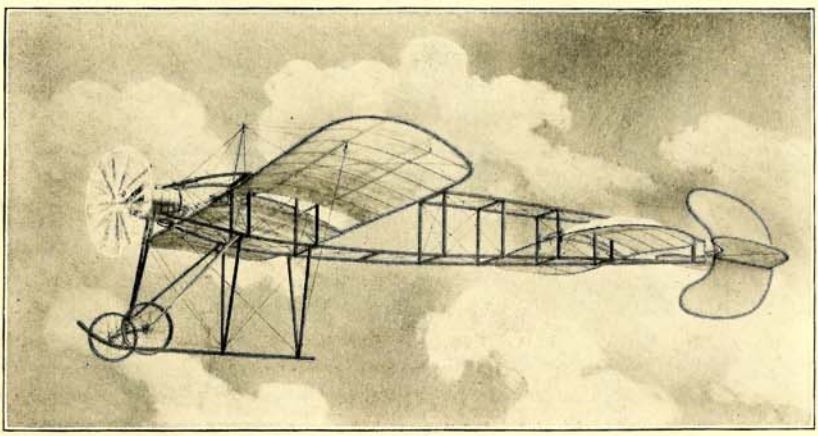
Milwaukee Electrical Show

JUNE 19, 20 and 21, 1913 **STROH BUILDING**
Jackson and Michigan Sts.

Name ..... *Occupation* .....

Address .....

What Can Be Seen at the Milwaukee Electrical Show—An Aeroplane Controlled by Wireless.



Electricity is so valuable and does such marvels that it is hard to believe that it existed for thousands of years unknown to men. Before the birth of Christ it was known that a certain iron ore,—loadstone, attracted other small pieces of metal to it and that a piece of amber, rubbed, would attract small bits of feathers, etc. In the 16th Century the first real experiments to ascertain the properties of electricity were made. In the 17th Century one experimenter made electric light but no one knew what it meant and thus through the following century and most of the 19th Century various groups of men worked for our present day convenience. It is only 30 years ago that electric lights came into general use so that there is every reason to believe that all that can be done with electricity has by no means been done since it took centuries to get to the point where any commercial use of electricity could be made.

Could Kelsin, Watson, Galvani, Faraday, Guricke or Franklin be invited to visit the Milwaukee Electrical Show which is to be held under the auspices of the Electroforce Publishing Co., and the School of Engineering of Milwaukee their first peep which would reveal to them a mass of electrical apparatus all set up for operation and test would amaze them to such as extent that they would be rooted to the spot. If these men had only had such apparatus in place of improvised devices what would they have accomplished?

As one enters the spacious, well lighted front hall of the Stroh building, a glance through the first large glass doors to the left takes

in the (beautiful) indirect and decorative lighting system of the large hall. The first large exhibit is that of the complete telephone exchange in operation. The large central board, the innumerable telephone stations located about the hall and the batteries are all exposed to view. Every connection is made and by calling up from one of the telephone stations in the hall it is possible to note just what takes place at the central operator's board and how you are connected to your party. This entire exhibit which was installed by the Wisconsin (Bell System) Telephone Co., is permanent and is to be used by the new telephone department of the School of Engineering.

To those of scientific trend the rows of testing benches located near the center of the hall is particularly interesting. Provisions for making 30 to 40 tests are made, giving a good opportunity for learning by **seeing.** Among the tests are:— measurement tests of insulation resistance of cables and wiring using the Wheatstone Bridge method; Demonstration of slide wire and telephone bridges; Determination of specific resistance of metals; Determination of temperature coefficients of conditions; Electro-heating tests; Determination of Jaule's law; Meter and other instrument testing; etc.

Just what series circuits, multiple circuits and multiple-series circuits are can be firmly fixed in one's mind by the exhibit of these circuits in the same hall. Also all types of arc lamps and incandescent lamps are in operation and various types of reflectors, fixtures etc., are displayed.

A Model House—All Wired.

The two story house completely wired and representing a considerable outlay of money shows just what everyone wants to see. It shows how the wires are run between real walls, between real floors and ceiling and how the lamps can be switched on or off, how the doorbell is rang, how the burglar is foiled by the alarm system, how the vacuum cleaner, the electric fan, washing machine, etc., may be connected. The fixtures for this residence are from the well-known fixture house of Chas. Polacheck & Bros. Co., Milwaukee. In this age everybody ought to know something about how a house may be wired and lighted, and how the household electric heating and other devices may be connected.

Sample boards showing all the various fittings and wiring devices used in electrical construction work are displayed near the model house so as to afford a good means of seeing both the device and the installation and use of it.

To illustrate the various methods of winding armatures of motors and generators a score or more armature models are shown which are being wound by students. Boards on which are mounted bell circuits annunciators, etc., allow the explanation of these circuits to be easily made and tests and experiments are conducted.

Before passing to the lecture room the battery tests and the exhibit of the Edison battery, sent by Thomas Edison, Inc., and the lead battery should receive your attention because of the increasing importance of batteries due to the development of the electric truck and vehicle business.

An Aeroplane Controlled by Wireless.

The lecture hall is to be south of the main hall and what at once attracts the eye on entering this room, is the whirling wireless-controlled aeroplane. This is a monoplane designed and built at a considerable outlay of time and money

by Mr. Edward Koeppel, a former student of the School of Engineering of Milwaukee. It is completely controlled by wireless—the key of the wireless set, controlling the starting of the motor, the rising, the turning and the returning to the ground of the aeroplane.

The horizontal, vertical and elevating rudders are separately controlled by a system of coherers, connected through coils turned to different wave lengths. To start the aeroplane from rest the sending system is turned to the wave length of the apparatus controlling the motor. A pressure on the key of the wireless set then starts the extra-high speed motor, (which runs at 5600 revolutions per minute) which operates the driving propeller. After some headway is gained the wave length is adjusted to correspond with the coherers controlling the elevating planes. The plane gradually rises until we again turn our instruments with those controlling the vertical rudder which operates to cause the aeroplane to circle and turn as desired. The descent, stopping of the motor and the landing are also controlled from the wireless instrument key.

In the editorial office of the Electroforce Publishing Co., located on the ground floor of the Stroh Bldg., the Krus Engraving Co., exhibit shows how the engravings or cuts that are used to reproduce photographs and drawings in Electroforce, are made. As few people understand this class of photography much interest is shown. The Western Printing Co., on whose presses Electroforce is printed have an out-of-the-ordinary exhibit of more than usual interest. Machine set type, specimen pages, etc. are shown.

The history and rapid growth of Electroforce "The Technical Magazine for Everybody" is illustrated by the exhibit of all the numbers of this journal beginning with the November 1912, 32 page issue to the fat 104 page current July number. This growth has been possible through the hard work of Mr. O. Werwath and in his wisdom in the selection of experienced editors. The articles and notes published in this magazine have been collected and written so as to be instructive, interesting and stimulating. Able men in the engineering field have

MR. OSCAR WERWATH,
Manager of Milwaukee Electric Show.

been secured as contributors of special articles on such topics as illuminating engineering, power house equipment, underground transmission systems, battery charging, motor installations, etc. Enough variety is always provided to interest the greatest number. The paid-up circulation has grown with the size of the issues.

As the elevator reaches the third floor the hum of the machinery is heard, Machinery Hall being located on this floor. Dynamos, motors, rotary converters, gas engines, machine tools, lathes, presses, etc., all in operation account for the

noise. Horse power tests are taken on the motors and gas engines and experiments conducted to ascertain the characteristic curves of the electric apparatus. The curves plotted on cross-section paper which indicate the possible performance of each particular apparatus, are displayed and explained.

Melting a piece of metal as thick as your fingers by current passed through a small bell wire is something that catches everybody. How this is done is clearly shown. The current is passed through a transformer to raise the voltage to 2300 volts then passed through a No. 18 wire then through another transformer to reduce it to 220 volts and then to a welding transformer which turns out about 2000 amperes of current which welts the metal. Of equal interest is the Thermit Process of Welding.

The Thermit Process of Welding and Producing Alloys.

Thermit, the well known welding compound discovered by Dr. Hans Goldschmidt in 1898, is a mixture of some metallic oxide with finely divided aluminum in such proportions that the aluminum on reaction will entirely reduce the metallic oxides to metals. The foundation of the Thermit reaction is the attraction of aluminum for oxygen. Aluminum readily reacts with the oxides of other metals with the production of an intense heat. That might very well be expected from the fact that aluminum has a greater heat of combustion, and also possesses a greater attraction for oxygen than the other heavier metals. If the attraction of the aluminum for the oxygen is very much greater than the other metal with which the oxygen is combined, then the Thermit reaction is a very rapid one liberating a large quantity of heat. If on the other hand the other metal also has a strong attraction for oxygen, then the reaction will still take place, but it will be very much slower, and in some cases requiring external heating to bring about a reaction. In these cases very little heat is evolved.

The thermit most commonly known, is a mixture of iron oxide and aluminum. This mixture when strongly heated at one point will react with the production of a very high temperature. The temperature produced by the reaction greatly exceeds that required to start the reaction. Consequently the reaction spreads rapidly throughout the whole mass, requiring from one-half to about one minute. The external heat necessary to start the Thermit reaction is in some cases supplied by burning a strip of magnesium stuck into the mixture. The magnesium strip is usually imbedded in strongly oxidizing substance like barium or sodium peroxide. If such a fuse is not at hand the reaction may even be started with a match.

From a chemical stand point the reaction that takes place is a very simple one. Thus, in the case of iron oxide and aluminum there is merely an exchange of the oxygen. The reaction that takes place may be represented by the following equation:

$Fe_2O_3 + 2Al = Al_2O_3 + 2Fe$

Fe = Iron; Al = Aluminum; O = Oxygen.

This equation simply means that one part by weight of iron oxide (rust) reacts with two parts by weight of aluminum forming aluminum oxide and metallic iron. The aluminum thus combines with the oxygen that was formerly combined with the iron and liberates the iron. The heat generated in this reaction, not shown in chemical equations, is sufficient to fuse the

aluminum oxide and boil the pure liquid steel produced. The temperature of the reaction is second only to that of the electric furnace, being estimated at 5,400 degrees Fahrenheit.

The technological importance of the Thermit process can hardly be over-estimated. In the first place the reaction serves for the preparation of a number of pure metals and alloys of considerable value in the iron and steel and allied industries. Among the various Thermits which are used commercially, outside of the well known welding compound, iron Thermit, may be mentioned, nickel Thermit, manganese Thermit, chromium Thermit, as well as Thermits used in connection with the production of special alloys, such as chromium-copper, molybdenum-nickel, manganese-titanium, ferro-titanium, etc.

Chromium is used in the manufacture of high-speed tool steel, as well as armor-plate; manganese is also used for the same purposes and especially in the manufacture of very hard steel.

Of all the alloys produced by the Thermit process the most important at the present time is the ferro-titanium. This alloy is a light grayish metal, hard and brittle in character and contains from 20 to 25 per cent titanium, a little aluminum and the rest iron. The ferro-titanium is used extensively as a purifying agent for iron and steel in the metallurgical field. Its beneficial effect is due primarily to its de-oxidizing action and the fact that it has the property of combining with the dissolved nitrogen in the iron, forming titanium nitride which passes into the slag. In practice only a very small amount of ferro-titanium is required for the ordinary purifying purposes. From 2½ to 5 lbs. of the alloy (20 to 25 per cent titanium) per 1000 lbs. of iron or steel is sufficient.

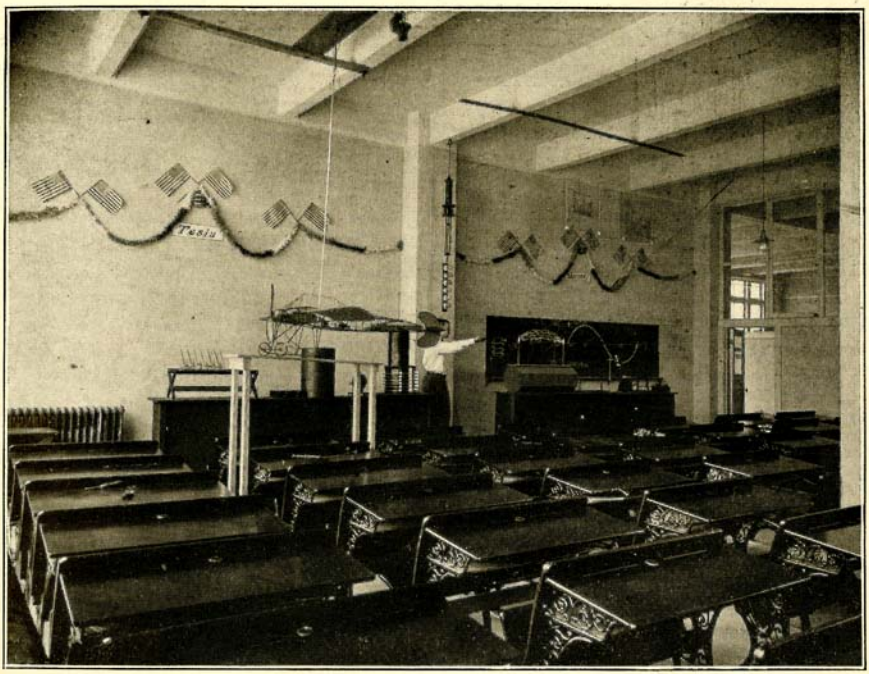
The iron Thermit with which the general public is most familiar is employed in welding electric rails for locomotive and steamship repairs, in fact in all sorts of repairs to iron and steel articles, irrespective of their size.

This new Thermit process is said to be yet in its infancy. From the chemist's laboratory crucible to the world wide use in all sorts of welding, in producing pure, carbonless metals and rare alloys, is the meteoric rise of this new branch of technology, to which the name of "Alumino-thermics" has been given.

Besides the Thermit process many other operations such as copper plating, nickel-plating, determination of electro-chemical equivalents, electrolysis, etc., command attention in the chemistry room. Samples of engineering drawings, reports, wiring connections, windings, etc., are also exhibited.

After seeing all these things and the sensational stunts, such as lighting a taper by mere contact with a human body, lighting of a candle by contact with a piece of ice, wireless lighting of an incandescent electric lamp bulb, the talking and playing of an electric arc lamp, one is well satisfied that he has seen more that is intensely interesting and instructive about electricity than has ever been possible in Wisconsin before.

That such an exhibition is of great benefit to all interested in electricity goes without saying. Where this exhibition differs is in the fact that instead of a line up of decorated booths, all space was devoted to show what electricity can do and how it does it. To Mr. Oscar Werwath, all the credit for this exhibition must be given. Of course he was able to enlist the co-operation of many able lieutenants, but this only shows that he is a good leader.



W. A. Biesman, Operating Wireless Aeroplane.

ELECTROFORCE

School of Engineering of Milwaukee will exhibit electric laboratory work, and actual tests and demonstrations will be given by the following students.

Armature Winding ..... Arthur Voigt, Gerald Otto

Telephones ..... E. Borgwardt, C. Goldammer

Wireless Telegraphy ..... Erwin Goerner, Frank Seal, Verne Austin

Lecture on High Frequency and Demonstration With Wireless Monoplane ..... W. A. Biesman

Experiments With Induction Coils ..... Edward Wesle, Willard D. Kehl, John Mosely

Electro-Heating Apparatus ..... John Nelson, Joe Leicht

Horsepower Tests of Motors ..... R. Cabello

Storage Battery Charging ..... Everett Vonier

Dynamo and Switchboard Connections, ... John Knickelbein, Carl Aken

Motor and Dynamo Connections, ... Edward Klenz, H. J. Steinburg

Fusing of Metals ..... Ole Austinson, Walter Jaeckel

Series Circuits ..... Elmer Eby, Ben Rosenfarb

Multiple Circuits ..... Alfred Friske, George Monthey

Burglar Alarm Circuits ..... Fred Dopke, Elmore Knox

Battery Connections ..... Jose Fellcissimo

Arc Lights ..... Walter Dorndorfer

Alternating Current Generator ..... James Dickinson, John Mackowski

Electric Light Wiring, ... C. Packman, C. Guilford, E. Loebe

Construction of Different Switches for Electric Lighting, ... R. Drummond

Annunciator Circuits ..... Albert Engle, Carl Korbel

Electric Bell Circuits ..... Wm. Tessler, R. Ortmann

House Wiring ..... Wm. H. Datson, Erwin Kries

Alternating Current Transformers ..... Stanton Mereness, Harry Soulen, Clarence Toussaint.

Demonstration of Wireless Telephone, Charles Cohen, Elmer Muckerheide

Ohms Law ..... Herbert Dittmar

Operation of Monoplane ..... Frank Seal, John Wenzel

Watt-Meters ..... L. Kosidnor, John Kuenzli

Determination of Watt-Meter Constant ..... Walter Strohmeyer

Chemistry, .. W. Bergemann, Paul Kannenberg, H. Steimke, F. Tschernitz

Resistance Tests ..... Wm. Smetana, E. Guillemin

Electric Light and Photometer Tests ..... Miguel Domingo

Talking Arc Lamps ..... Hugo Fesenmaier, Lionel Snyder

Magnetism Electro-Magnetism and Induction ..... J. W. Wacker, W. R. Pritchard, Ewald Schilke

Ohm Meter Tests ..... Frank Lexa

COME ON UP
THE TELEPHONE WAY

IS your ear to the receiver? Do you know that the big telephone companies are asking you to get a start toward the big positions in the telephone field? They are telling you to "Come On Up." They need men and young men who have had some training. Your big chance is to attend

SCHOOL OF ENGINEERING OF MILWAUKEE

HAS A COMPLETE TELEPHONE EXCHANGE

Installed by WISCONSIN TELEPHONE CO. of Milwaukee

The telephone exchange recently installed in the School of Engineering of Milwaukee is an actual operating duplicate of the system used in the Grand Exchange of the Wisconsin Telephone Co., (Bell System) Milwaukee. It is the only one of its kind in the state or probably anywhere.

You can fit yourself for interesting, well-paying work by studying telephony in our day or night school. Because of the preciseness of everything connected with the telephone business the training will also give you a systematic, logical mind.

STUDY NOW— Position and Money Will Follow

Don't put off getting a start, attend to it now. The expense of fitting yourself for work that you are worthy of, is small, cut out the coupon below and mail to-day.

Electric Wiring, Drafting, Engineering and Chemistry also taught in the most practical way, by practical instructors. Our workshops and laboratories are equipped with all the motors, generators, batteries, transformers, lights, switchboards, etc., necessary to allow the student to become thoroughly familiar with all kinds of apparatus. This is the easiest way to learn.

CUT OUT THIS COUPON AND MAIL TO

School of Engineering of Milwaukee, Stroh Bldg., Milwaukee, Wis.

Gentlemen: I assume no obligations by asking you to please send me full particulars concerning the course or courses underlined: Telephony, Electric Wiring Engineering, Drafting, Chemistry.

Name.....

Street.....

City and State.....